20V P 通道 NexFET™ 功率金属氧化物半导体场效应晶体管 (MOSFET)

查询样片: CSD25402Q3A

特性

- 超低 Q_g 和 Q_{gd}
- 低热阻
- 低 $R_{DS(on)}$
- 无铅且无卤素
- 符合 RoHS 环保标准
- 小外形尺寸无引线 (SON) 3.3mm × 3.3mm 塑料封装

应用范围

- 直流-直流转换器
- 电池管理
- 负载开关
- 电池保护

说明

这款 -20V，7.7mΩ NexFET™ 功率 MOSFET 被设计成最大限度地减少 SON 3 × 3 封装内的功率转换负载管理应用中的损耗，此封装类型针对器件的尺寸提供出色的热性能。

产品概述

V_{DS}	漏源极电压	-20		V
Q_g	栅极电荷总量 (-4.5V)	7.5		nC
Q_{gd}	栅极电荷漏极	1.1		nC
$R_{DS(on)}$	漏源导通电阻	V_{GS} = -1.8V	74	mΩ
		V_{GS} = -2.5V	13.3	mΩ
		V_{GS} = -4.5V	7.7	mΩ
V_{th}	阀值电压	-0.9		V

订购信息

器件	封装	介质	数量	出货
CSD25402Q3A	SON 3 × 3 塑料封装	13 英寸卷带	2500	卷带封装

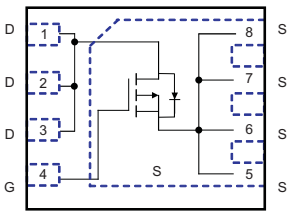
绝对最大额定值

T_A = 25°C		值	单位
V_{DS}	漏源电压	-20	V
V_{GS}	栅源电压	+12 或 -12	V
I_D	持续漏极电流，T_C = 25°C 时测得	-72	A
	持续漏极电流（受封装限制）	-35	A
	持续漏极电流(1)	-15	A
I_{DM}	脉冲漏极电流(2)	-82	A
P_D	功率耗散(1)	2.8	W
T_J, T_{STG}	运行结温和储存温度范围	-55 至 150	°C

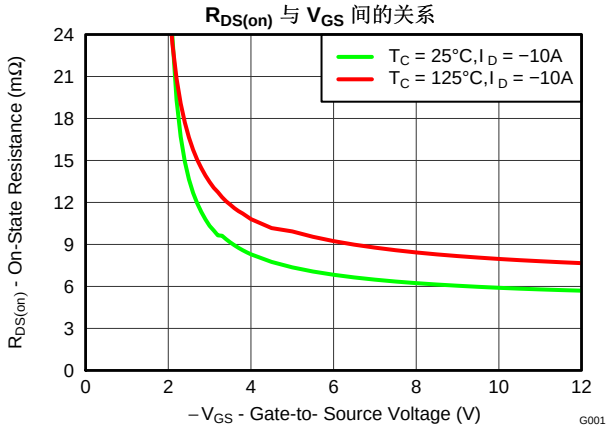
(1) $R_{\theta JA}$ = 55°C/W，这是在厚度为 0.060" 的环氧树脂 (FR4) 印刷电路板 (PCB) 上的 1 英寸^2 铜过渡垫片（2 盎司）上测得的典型值。

(2) 脉宽 ≤ 300μs，占空比 ≤ 2%

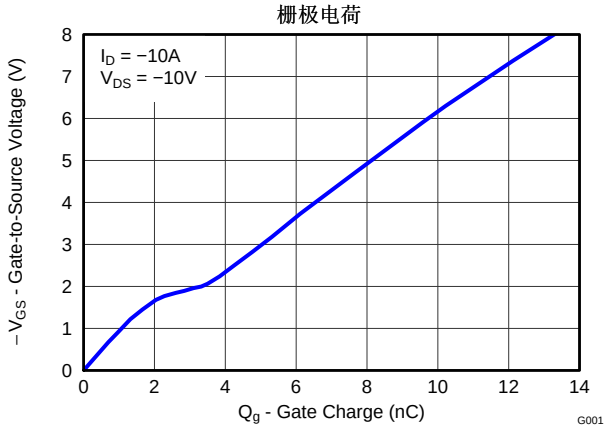
顶视图



$R_{DS(on)}$ 与 V_{GS} 间的关系



栅极电荷



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ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

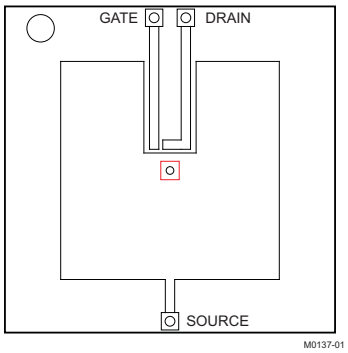
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Static Characteristics						
BV_{DSS}	Drain-to-Source Voltage	V_{GS} = 0 V, I_D = –250 µA	–20			V
I_{DSS}	Drain-to-Source Leakage Current	V_{GS} = 0 V, V_{DS} = –16 V			–1	µA
I_{GSS}	Gate-to-Source Leakage Current	V_{DS} = 0 V, V_{GS} = ±12 V			–100	nA
$V_{GS(th)}$	Gate-to-Source Threshold Voltage	V_{DS} = V_{GS}, I_D = –250 µA	–0.65	–0.90	–1.15	V
$R_{DS(on)}$	Drain-to-Source On Resistance	V_{GS} = –1.8 V, I_D = –1 A		74	300	mΩ
		V_{GS} = –2.5 V, I_D = –10 A		13.3	15.9	mΩ
		V_{GS} = –4.5 V, I_D = –10 A		7.7	8.9	mΩ
g_{fs}	Transconductance	V_{DS} = –10 V, I_D = –10 A		59		S
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{GS} = 0 V, V_{DS} = –10 V, f = 1 MHz		1380	1790	pF
C_{OSS}	Output Capacitance			763	992	pF
C_{RSS}	Reverse Transfer Capacitance			39	51	pF
R_G	Series Gate Resistance			3.7	7.4	Ω
Q_g	Gate Charge Total (4.5 V)	V_{DS} = –10 V, I_D = –10 A		7.5	9.7	nC
Q_{gd}	Gate Charge Gate to Drain			1.1		nC
Q_{gs}	Gate Charge Gate to Source			2.4		nC
$Q_{g(th)}$	Gate Charge at V_{th}			1.0		nC
Q_{OSS}	Output Charge	V_{DS} = –10 V, V_{GS} = 0 V		7.6		nC
$t_{d(on)}$	Turn On Delay Time	V_{DS} = –10 V, V_{GS} = –4.5 V, I_D = –10 A , R_G = 5 Ω		10		ns
t_r	Rise Time			7		ns
$t_{d(off)}$	Turn Off Delay Time			25		ns
t_f	Fall Time			12		ns
Diode Characteristics						
V_{SD}	Diode Forward Voltage	I_S = –10 A, V_{GS} = 0 V		–0.8	–1	V
Q_{rr}	Reverse Recovery Charge	V_{DS} = –8.5 V, I_F = –10 A, di/dt = 200 A/µs		10.3		nC
t_{rr}	Reverse Recovery Time			21		ns

THERMAL CHARACTERISTICS

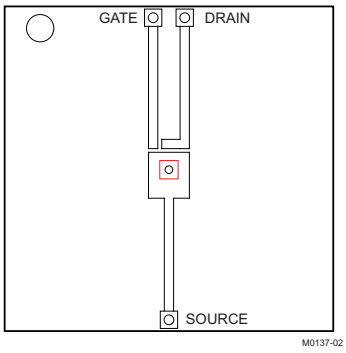
(T_A = 25°C unless otherwise stated)

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Thermal Resistance Junction to Case(1)			2.3	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient(1)(2)			55	°C/W

(1) $R_{\theta JC}$ is determined with the device mounted on a 1-inch^2 (6.45-cm^2), 2-oz. (0.071-mm thick) Cu pad on a 1.5-inch × 1.5-inch (3.81-cm × 3.81-cm), 0.06-inch (1.52-mm) thick FR4 PCB. $R_{\theta JC}$ is specified by design, whereas $R_{\theta JA}$ is determined by the user's board design.
(2) Device mounted on FR4 material with 1-inch^2 (6.45-cm^2), 2-oz. (0.071-mm thick) Cu.



Max $R_{\theta JA}$ = 55°C/W when mounted on 1 inch^2 of 2 oz. Cu.



Max $R_{\theta JA}$ = 175°C/W when mounted on minimum pad area of 2 oz. Cu.

TYPICAL MOSFET CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

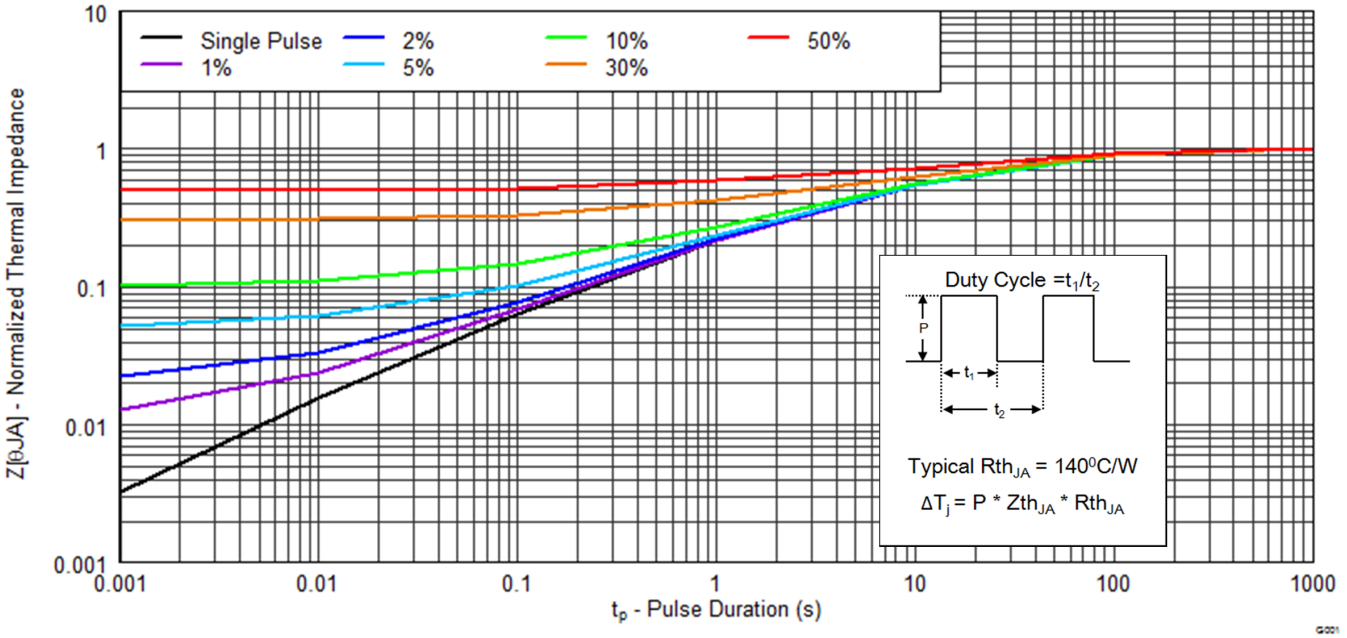


Figure 1. Transient Thermal Impedance

TYPICAL MOSFET CHARACTERISTICS (continued)

(T_A = 25°C unless otherwise stated)

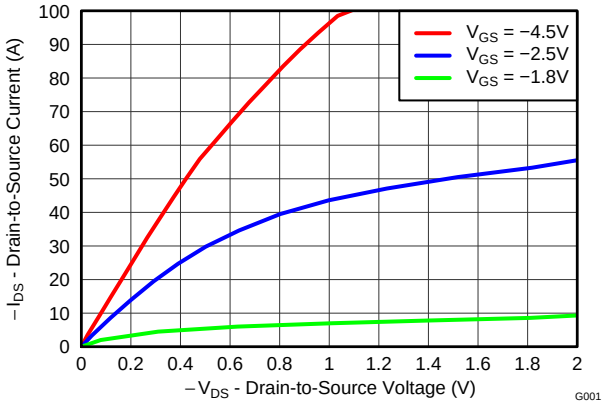


Figure 2. Saturation Characteristics

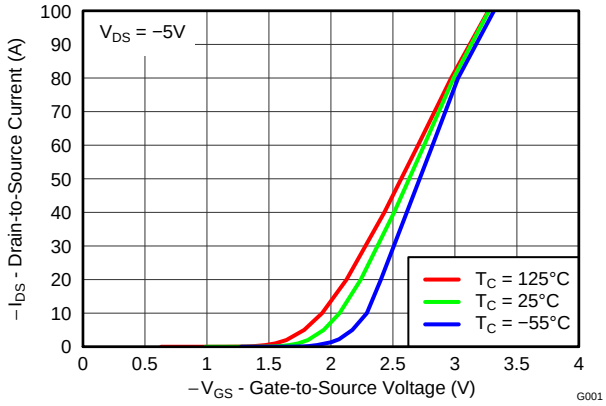


Figure 3. Transfer Characteristics

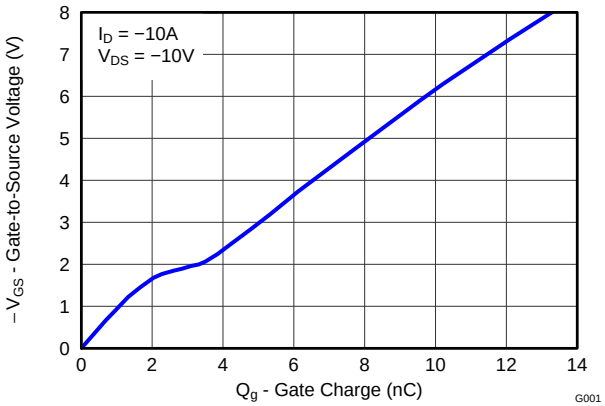


Figure 4. Gate Charge

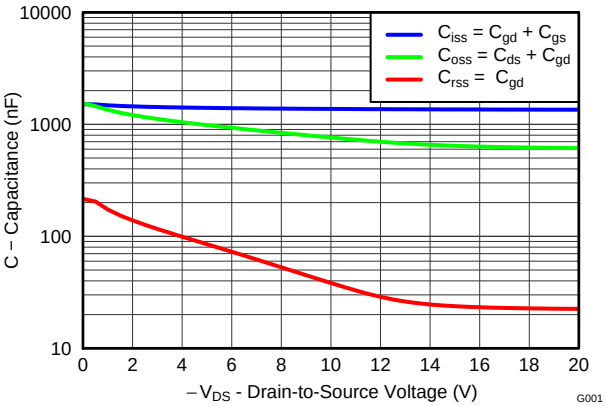


Figure 5. Capacitance

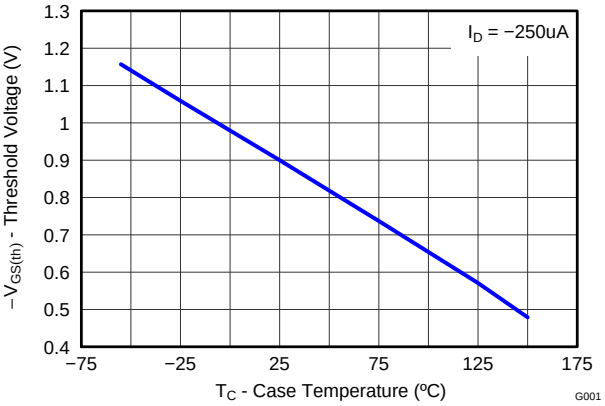


Figure 6. Threshold Voltage vs. Temperature

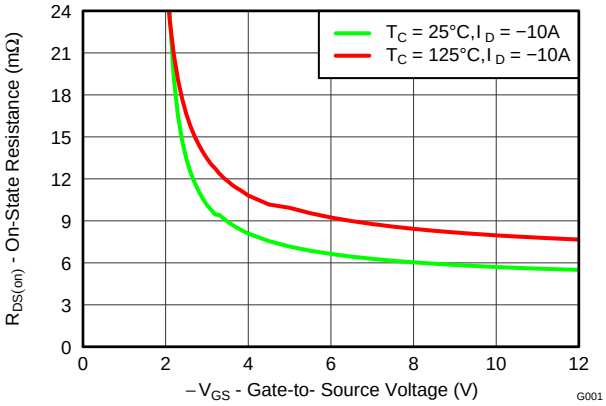


Figure 7. On-State Resistance vs. Gate-to-Source Voltage

TYPICAL MOSFET CHARACTERISTICS (continued)

(T_A = 25°C unless otherwise stated)

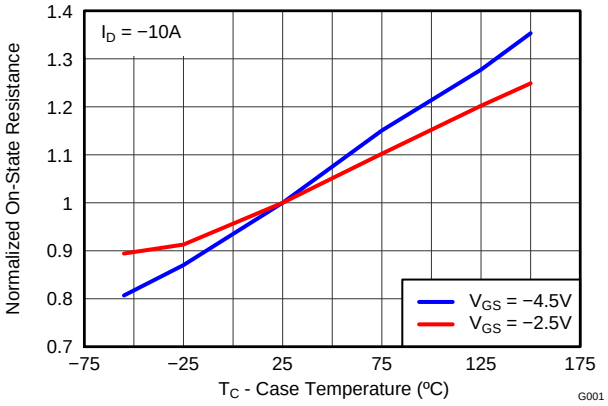


Figure 8. Normalized On-State Resistance vs. Temperature

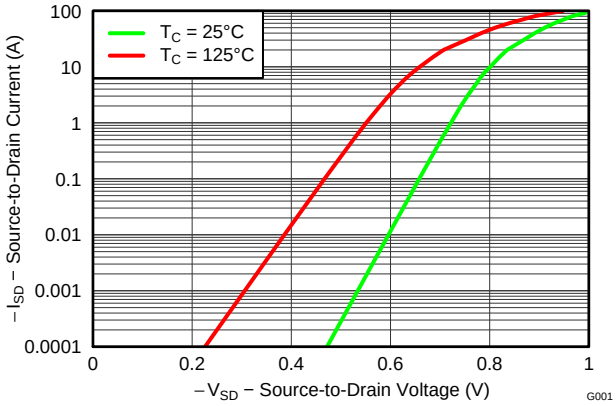


Figure 9. Typical Diode Forward Voltage

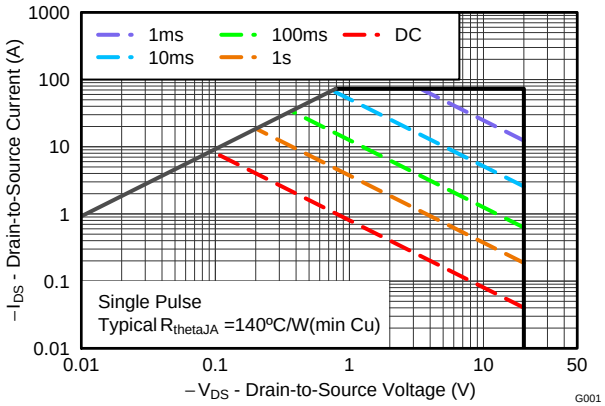


Figure 10. Maximum Safe Operating Area

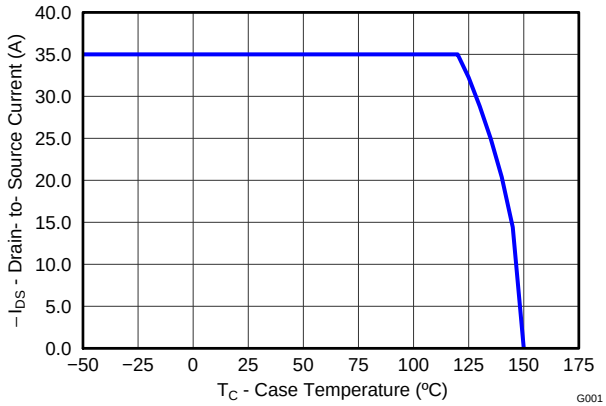
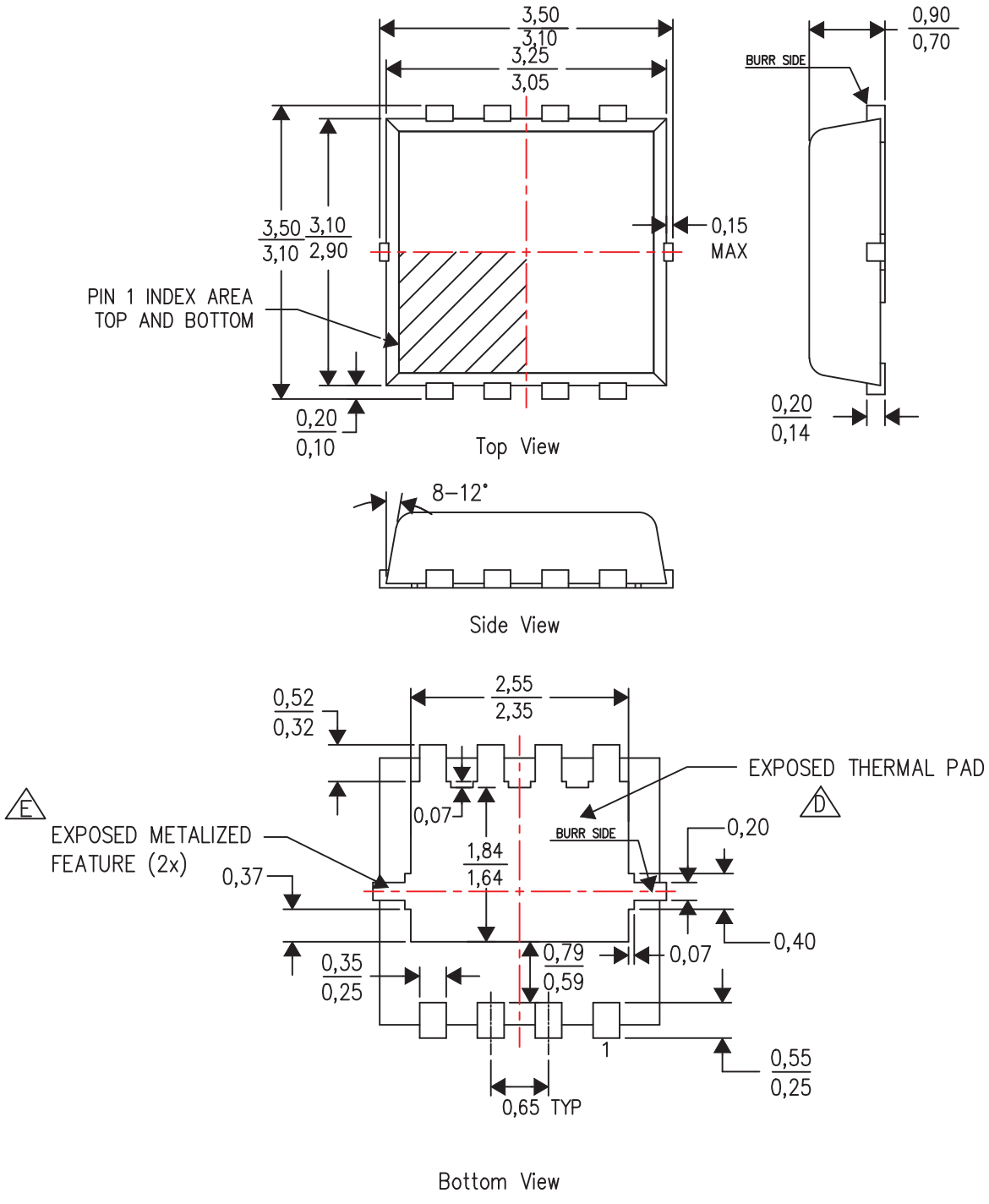


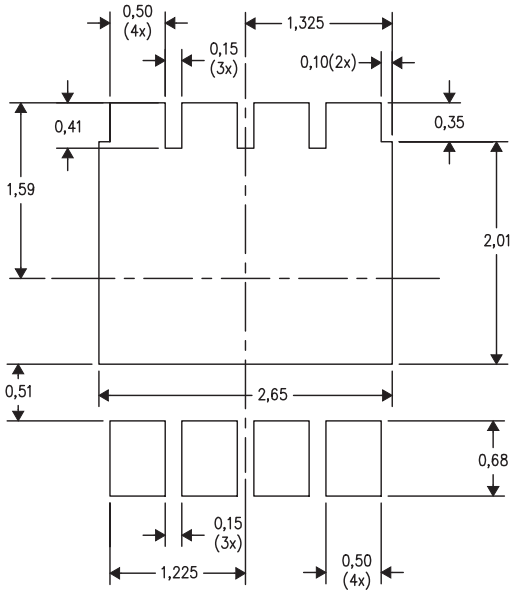
Figure 11. Maximum Drain Current vs. Temperature

MECHANICAL DATA

Q3A Package Dimensions

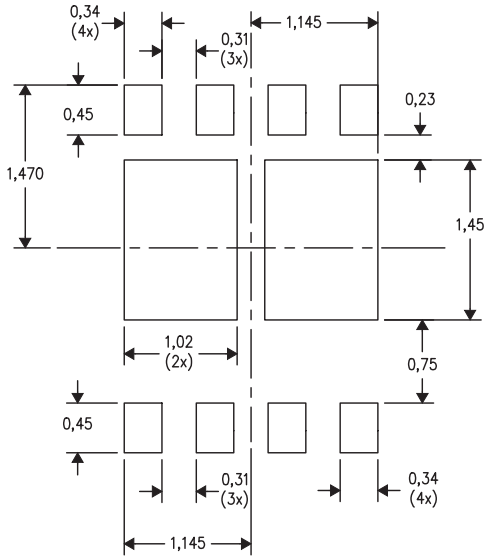


Q3A Recommended PCB Pattern

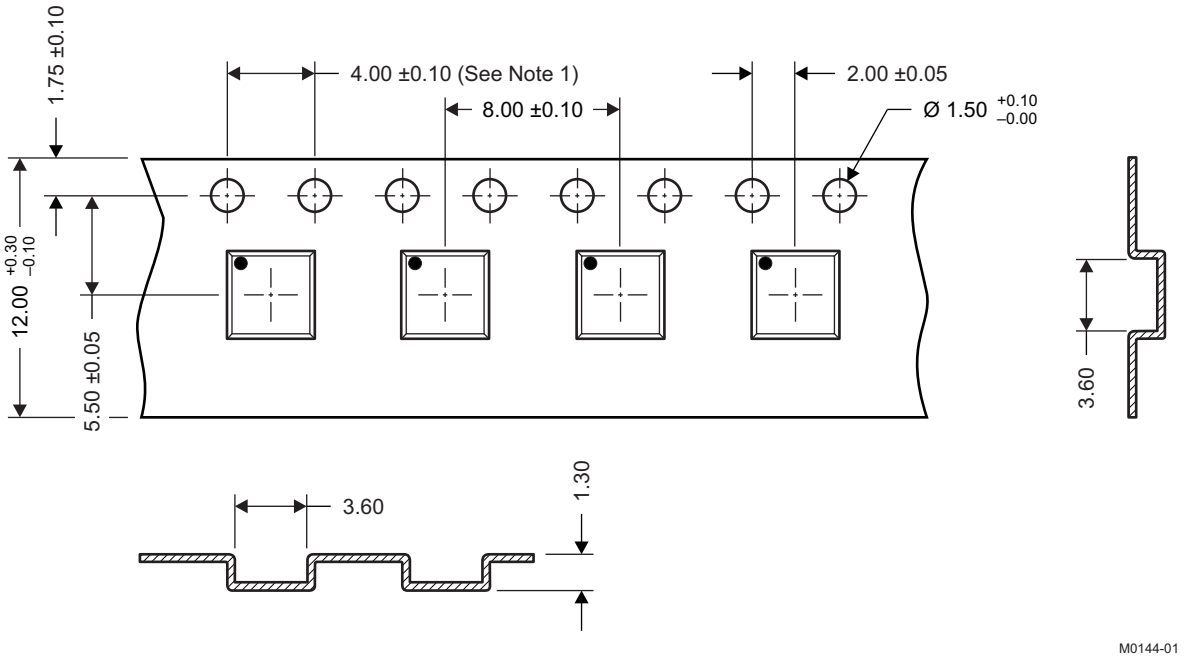


For recommended circuit layout for PCB designs, see application note SLPA005 – *Reducing Ringing Through PCB Layout Techniques*.

Q3A Recommended Stencil Pattern



Q3A Tape and Reel Information



Notes: 1. 10-sprocket hole-pitch cumulative tolerance ±0.2

2. Camber not to exceed 1 mm in 100 mm, noncumulative over 250 mm
3. Material: black static-dissipative polystyrene
4. All dimensions are in mm, unless otherwise specified
5. Thickness: 0.30 ±0.05 mm
6. MSL1 260°C (IR and convection) PbF reflow compatible

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CSD25402Q3A	ACTIVE	VSONP	DNH	8	2500	RoHS & Green	SN	Level-1-260C-UNLIM	-55 to 150	25402	Samples
CSD25402Q3AT	ACTIVE	VSONP	DNH	8	250	RoHS & Green	SN	Level-1-260C-UNLIM	-55 to 150	25402	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

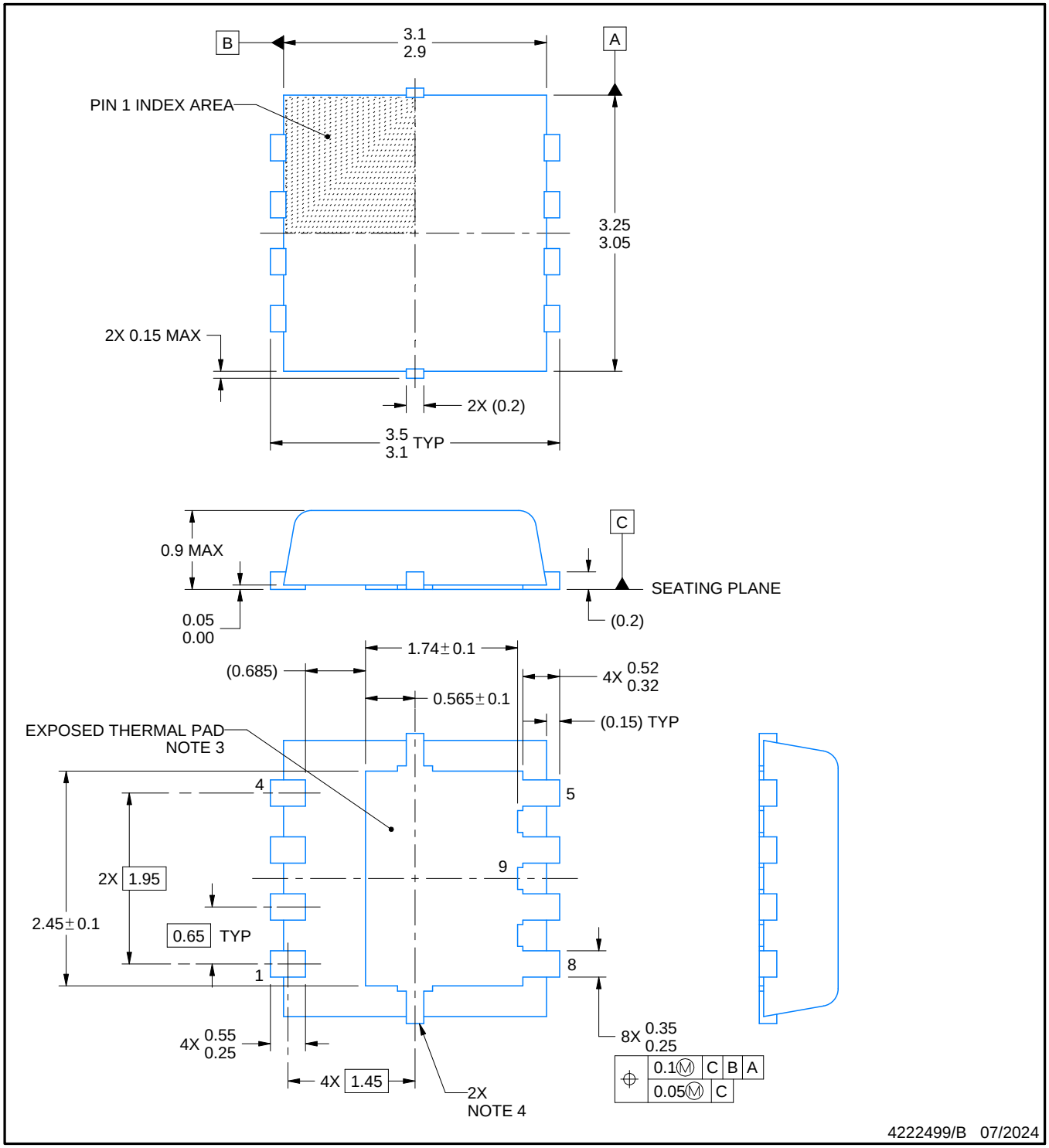
(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

DNH0008A

PACKAGE OUTLINE

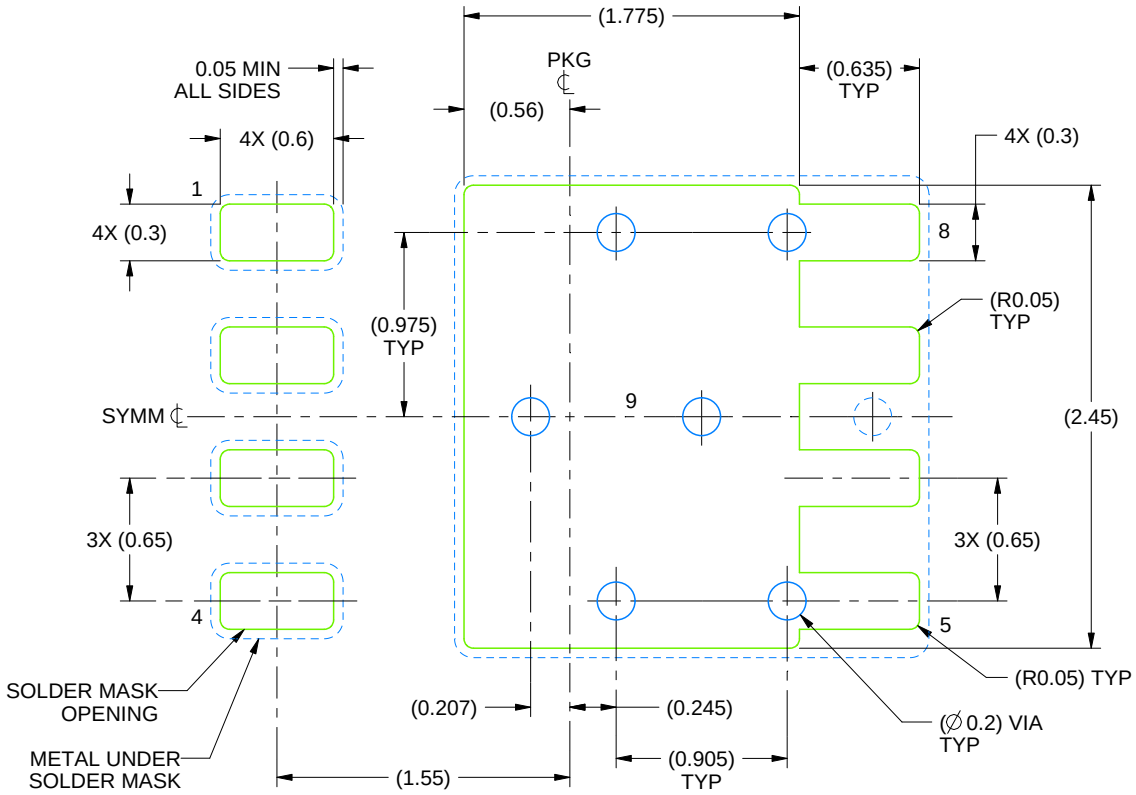
VSONP - 0.9 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.
4. Metalized features are supplier options and may not be on the package.
5. All dimensions do not include mold flash or protrusions.



LAND PATTERN EXAMPLE
SOLDER MASK DEFINED
SCALE: 25X

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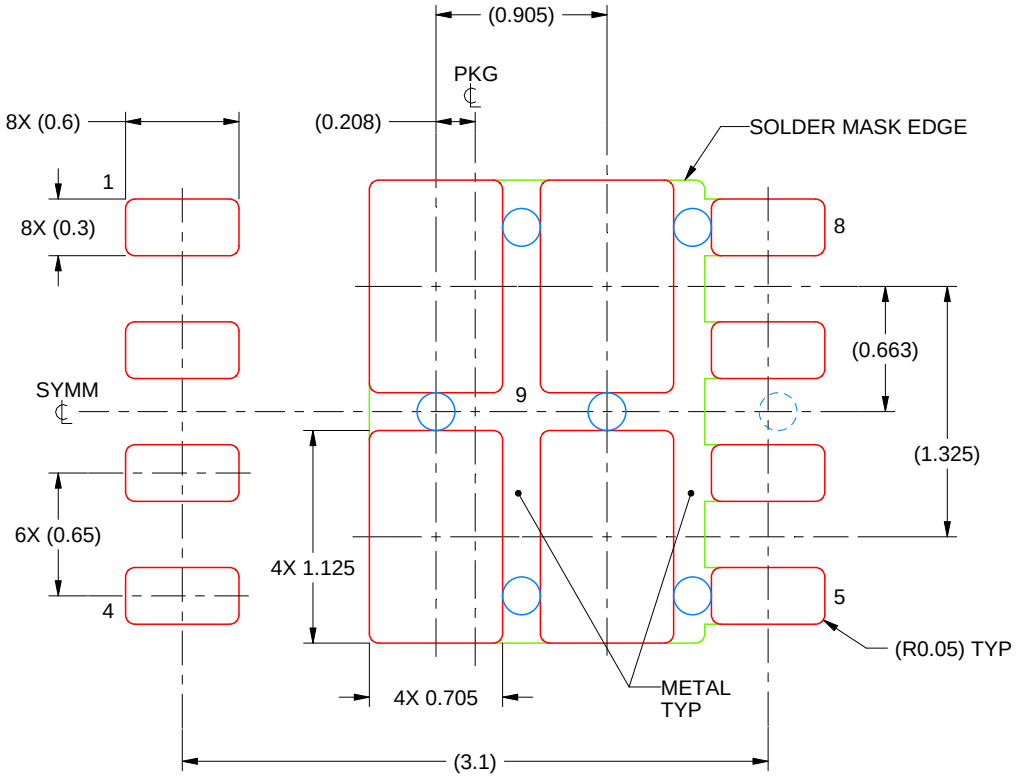
NOTES: (continued)

6. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
7. Vias are optional depending on application, refer to device data sheet. If some or all are implemented, recommended via locations are shown.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD 9:
76% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE
SCALE: 25X

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NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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